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AUTHOR Hug, William E.
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ABSTRACT

By definition, the fields of instructional technology and media are committed to an evaluation, generation, and application of research involving the act of teaching and the phenomena of learning, with differences in systems determined by the purpose for which instructional technology and media are applied. However success or failure of any teacher throughout history is related to the type of technology employed and the impact of external technology on the learning process. World War II is generally recognized as the beginning of the fields of instructional technology and media as they are currently conceived. Since then, numerous individuals and organizations, including the military, industry, schools, colleges and professional organizations, have developed, applied, and evaluated the ideas instructional technology and media with varying results. Since these fields are interdisciplinary and are partially a result of a shift away from separate educational movements toward a systems approach, various attempts have been made to distinguish professional functions. Although past research has focused on film, radio, television, instructional technology, systems, and programmed instruction, the greatest immediate need is assessing the informational needs of various publics concerned with education. (CWH)

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INSTRUCTIONAL TECHNOLOGY:
FACTORS INFLUENCING THE FIELD

by

William E. Hug

ERIC Clearinghouse on Information Resources
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William E. Hug is Chairman of the Department of Curriculum and Teaching at Teachers College, Columbia University.

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INSTRUCTIONAL TECHNOLOGY:
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All men are system designers, and each man tries to determine what, in his world, is the largest system and the smallest. For each human, the system he designs is his life, i.e., his self. The question all of us face is what is the largest and smallest system which constitutes the self? Where does self designing begin and end?¹

INTRODUCTION

To select a purpose and to design a plan is to capitalize on the richest of human endowments--intelligence. The nature of human purposes and plans is framed in the content and structure of an individual's life space which supports, ignores, and blocks the manner in which this endowment is spent.

Society and its institutions create environmental structures enticing one to linger, to ponder and wonder, to savor with relish, and to enjoy. Other structures provide purpose, meaning, and reward for hard, efficient, and thoughtful work, while still other quarters of an individual's life space nurture love, caring, sharing, and giving. The school, as part of society and its institutions, intentionally or unintentionally, successfully or unsuccessfully, builds these structures, too. "It is the structure of the school...that instructs most systematically, and it is the structure that the students respond to first and remember longest."²

It is in the understanding and orchestration of these structures, these environments, and these life spaces that instructional technology and media can and are making their greatest contribution. In the purest form, instructional technology is an inquiring system, drawing on the

¹C. West Churchman, The Design of Inquiring Systems: Basic Concepts of Systems and Organization. New York: Basic Books, 1971, 7-8.

²Joseph C. Grannis, "The School as a Model of Society," Technology and the Curriculum. P. W. F. Witt, ed. New York: Teachers College Press, 1968, 103.

logic and sometimes the processes of general systems theory and other disciplines, including education, and applying this logic and these processes to build structure and content from media--the resources available. Media, in this context, record, store, process, and/or deliver information for the purpose of producing knowledge and include, first and foremost, humans, as well as print materials, still and moving images, recorded sound, computers, real objects, and environmental structures. Instructional technology, therefore, is the identification, generation, application and evaluation of processes which create a purposeful, facilitating structure from available resources. As such, instructional technology is both an art and a science.

This view of instructional technology and media has released the creative imagination of media program managers and instructional materials developers, of scholars of media and curricular systems, and of many others concerned with educational improvement. This view has given meaning and direction to many media professionals who had somehow become lost in a world of their own. Similarly, this view has provided planners with new alternatives and with more professionals prepared to collaborate on larger concerns. And, at the same time the surfacing of instructional technology and media as a force for educational improvement has attracted a new breed of young scholars dedicated to transforming the system by bringing their energy and enthusiasm to bear on the whole in a precise and logical fashion. Leaders with the responsibility and power to direct the total educational structure no longer refuse to recognize the potential and actual contribution of instructional technology and media or to assume the task of coordinating that contribution in the total effort.

The fields of instructional technology and media are emerging as are educational thought and action. The definitions and philosophies, processes and resources, organizations, history, roles, and research provide an overview of the fields and also outline the past and future contributions to the total educational effort.

Definitions and Philosophies

Instructional technologists attempt to find meaning in research about the nature of the learner (e.g., DeCecco³), the teacher (e.g., Getzels and Jackson⁴), the system (e.g., Bertalanffy⁵), the media and man's perceptual systems (e.g., Travers⁶), as well as methodological problems such as sequencing of instruction (e.g., Briggs⁷). Instructional technology, therefore, is a process of bringing this kind of knowledge to bear on designing instructional systems, including production, implementation, and evaluation of instructional media.

By definition the fields of instructional technology and media are committed to an evaluation, generation, and application of research

³John P. DeCecco, The Psychology of Learning and Instruction. Englewood Cliffs, New Jersey: Prentice-Hall, 1974, 47-173.

⁴J. W. Getzels and P. W. Jackson, "The Teacher's Personality and Characteristics," Handbook of Research on Teaching. N. L. Gage, ed. Chicago: Rand McNally, 1963, 448-505.

⁵Ludwig von Bertalanffy, General System Theory. New York: George Braziller, 1968.

⁶Robert M. W. Travers, Man's Information System: A Primer for Media Specialists and Educational Technologists. Scranton: Chandler, 1970.

⁷Leslie J. Briggs, Sequencing Instruction in Relation to Hierarchies of Competence. Pittsburgh: American Institutes for Research, 1968.

involving the act of teaching and the phenomena of learning. The President's Commission on Instructional Technology (1970) describes the notion of instructional technology as a process.

[Instructional] technology is more than the sum of its parts. It is a systematic way of designing, carrying out, and evaluating the total process of learning and teaching in terms of specific objectives, based on research in human learning and communication and employing a combination of human and non-human resources.⁸

Similarly, the Definitions and Terminology Committee of the Association for Educational Communications and Technology (ARCT) states:

Educational Technology is a field involved in the facilitation of human learning through the systematic identification, development, organization and utilization of a full range of...resources, and through the management of these resources. It includes, but is not limited to, the development of instructional systems, the identification of existing resources, the delivery of resources to learners, and the management of the processes and the people who perform them.⁹

The nature of the working definitions of instructional technology and media as it moves toward a whole view of instruction as a process of communication embraces many philosophies and fields of endeavor. The differences are in the purposes for which instructional technology and media are applied. This means that the assumptions professionals make in the fields of technology and media do not establish a uniform

⁸National Center for Educational Statistics, A Handbook of Standard Terminology and a Guide for Recording and Reporting Information about Educational Technology. Second draft. Washington, DC: U.S. Office of Education, August, 1974, 8.

⁹Robert Heinich, Technology and the Management of Instruction. Washington, DC: Association for Educational Communications and Technology, 1970, chapter 5.

operational philosophy from which professionals working in these areas must operate.

On the contrary, this has not been the case of critics of instructional technology and media. The nature of the criticism has almost always implied a stance and a bias.

*I am suggesting that those arguing the case for educational technology are on the side of positivism and behaviorism, and that those opposed are on the side of existential or experiential philosophy, of orientations focusing on will, purpose, choice.*¹⁰

with limited or no documentation.

There has been an audible distinction in the once-ebullient claims of the technologist that, given the opportunity, he could revolutionize American education. In contrast to the initial excitement over the promise of educational technology, a pervasive feeling of skepticism is now discernible when this promise is compared with the relatively unimpressive results of technological innovation to date. Nowhere is performance failure so glaring as in urban education, where the problems have been most urgent. The story of educational technology's fall from grace is told differently by those who are still selling it and those who have used it.¹¹

The nature of such criticism is to deal in the black and white and to take the best ideas from the critic's point of view and the worst from that which they would destroy. Critics of technologists build stereotypes which invariably stand as metaphors that exaggerate reality and ignore individuals who represent the best ideas in the field. For example, many view instructional technology and systems approaches as

¹⁰Maxine Greene, "Technology and the Human Person," Technology and the Curriculum, P. W. F. Witt, ed. New York: Teachers College Press, 1968, 138.

¹¹Francis A. J. Jauni and Peter S. Rosenbaum, "Technology in the Educational Marketplace." New York: Teachers College (working paper, TM-0001-EX), February, 1970, 1.

incompatible with humanism.¹² Yet, Erving Laszlo in his book entitled The Systems View of the World is concerned with human fulfillment as it takes place in some context, within some system, and within the human situation. To Laszlo, the individual within the system is involved in a dynamic process of integration and adjustment, creating conditions for the realization of human potentials.¹³

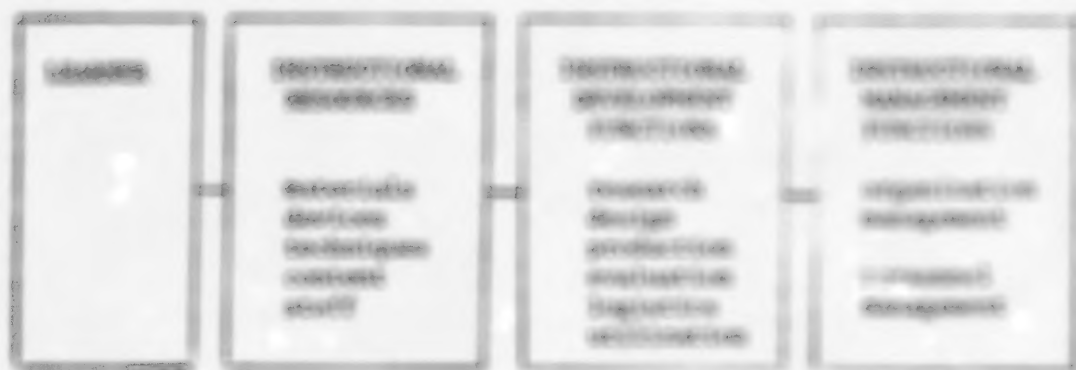
Processes and Resources

The concept of any instructional system includes the purposes for which the system exists, and the interaction between the parts of the system. The nature of the purposes identified is the most important factor in determining the kind of system to be developed. Many instructional technologists favor a certain type of paradigm to organize their ideas. They speak of verbal analogies and mathematical models and come to spend a great deal of effort in presenting their ideas in the style of a flowchart.¹⁴ This search for the ideal paradigm as well as for the various educational system is a popular activity of many educators. The techniques they employ reflect the nature of the time--resources and resources available--as much as any philosophical act of choice

¹²The kind of humanism used here is concerned with human beings, their aspirations, their creation potentials, and their as a community and not Humanism which was a reflection of the literature, art, and civilization of Greece and Rome during the Renaissance.

¹³Erving Laszlo, The Systems View of the World. New York: George Braziller, 1972, 118.

¹⁴Joseph E. Hill, How Schools Can Apply Systems Analysis. Bloomington, Indiana: The Phi Delta Kappa Educational Foundation, 1972.



THE NATURE OF TECHNOLOGICAL KNOWLEDGE¹⁶

The author also has provided the definition followed given to technology:

Technology means the systematic application of scientific or other organized knowledge to practical needs. The most important consequences... is its forcing the discovery and substitution of one such need into the commonest needs. Thus, and with this, one organized knowledge is brought to bear on existence.¹⁷

As this point is right to note that the professional aspect of the 1980 design group of business college curriculum the point of professional with various specialties working together for a common purpose.

Now, the author and follower's definition make obvious the point that is being made and the point that needs to be done to enhance the fields of technological knowledge and skills. For example, business technology under the leadership of David E. The has made substantial

¹⁶ Ibid., 31.

¹⁷ Also known as technology, The Industrial World. Boston: George W. Heath, 1967, 35.

contributions in the general instructional development process, while Arizona State University has attempted to concentrate its effort on the theory of designing, validating, and installing educational products (materials). Ivor K. Davies and Robert Heinich at Indiana University have applied systems techniques to instructional management as well as other problems of instruction, and Robert Gagné and Leslie Briggs at Florida State University have applied their instructional development model to restructuring training programs for the Navy.

Although no one university can be credited with outstanding work in the entire field described, during the fifties the late James Finn of the University of Southern California conceived the field of instructional technology and described it in terms of the process it employs. Today, in a commentary on one application of instructional technology (the performance-based teacher education movement), the field is again described as a process.

The FBTE process includes five interrelated operations. Each operation is distinct but dependent on all other operations if the process is to be successful.

1. The bases for decision making about development and implementation are clearly defined...
2. Outcomes for students and programs are specifically and operationally defined....
3. Program design is congruent with both student and program outcomes....
4. Student and program outcomes are evaluated periodically....
5. Operations within the process are revised and/or specifications are changed according to feedback from the evaluations....

The use of process is related to general systems theory. Systems theory offers a way of looking at a total organization and all of its related operations and a systematic

way of gathering information that could be the basis for rational change.¹⁸

Organizations

Numerous organizations and individuals have developed, applied, and evaluated the idea of instructional technology. Both the military and industry are consumers and producers of instructional technology and media. Schools and colleges have incorporated instructional technology and media informally and formally by creating divisions of instructional development, instructional technology, and instructional research and development. Colleges and universities have practically eliminated departments carrying the term audiovisual instruction as a program title, and graduate schools of library science are gradually moving toward library-media-information programs including all media and their accompanying technologies.¹⁹ Professional organizations and state departments of education are also actively promoting the expanded notion of educational and instructional technology and media.

Military and Industry. Faced with the staggering problems of preparing military personnel during World War II, the military plunged wholesale into the business of mass education with a heavy emphasis on aids, manuals, and films. As in many other educational efforts, the folly of materials development without system planning became evident.

¹⁸William Drummond, Lorrin Kennamer, Margaret Lindsey, and Gilbert Shearson, Performance-Based Teacher Education: A 1975 Commentary. Washington, DC: American Association of Colleges for Teacher Education, July, 1975, 3-4.

¹⁹William E. Hug, Strategies for Change in Information Programs. New York: R. R. Bowker, 1974, vii-14.

The war effort brought the first significant convergence of the audiovisual tributary with the mainstream of instructional technology. Also, as a result of the war experience, both audiovisualists and educators generally developed an increased sensitivity to the applicability of scientific theories of learning to practical problems of instruction. Moreover, there evolved an increased sophistication concerning the function and role of the media and/or communications specialist within the total context of instructional technology.²⁰

Interservice Procedures for Instructional Systems Development represents a commitment by the Army, Navy, Marine, and Airforce to the sophisticated application of instructional technology. The military is now making a concentrated effort to apply the procedures outlined in this four volume set.²¹ For example, the competencies needed by management level personnel in the Validation Branch of the U.S. Army Transportation School at Fort Eustis have recently been completed.²² This is but one example of the detailed work necessary to apply instructional technology and to establish the division-of-labor essential to improvement of instruction.

Instructional programs developed by industry have followed a pattern similar to that of the military. Today, industry generally follows an instructional development model (e.g., Tracey²³) and works within the paradigm discussed earlier. Industry has not only adapted instructional

²⁰Paul Saettler, A History of Instructional Technology. New York: McGraw-Hill Book Company, 1968, 180.

²¹Interservice Procedures for Instructional Systems Development, four volumes, Fort Eustis, VA: U.S. Army Transportation School, 1975.

²²L. C. Coot, William E. Hug, and Wesley K. Roberts, Competencies for Management Level Personnel, Validation Branch, USATSCH, Fort Eustis, VA: U.S. Army Transportation School, 1978.

²³William R. Tracey, Designing Training and Development Systems. Chicago: American Management Association, 1971.

technology and media for preparing educational programs but also contributed to the fields themselves. For example, the High Intensity Reading program of Random House developed a technological system for accessing commercially prepared materials by objective. Westinghouse Learning Corporation developed a total, integrated, individualized educational system (Project PLAN), and Science Research Associates (IBM) is producing systems of instruction. Besides the production of new media and the application of instructional technology, industry is also contributing to basic research and development activities in instructional technology and media (e.g., Tosti and Ball²⁴).

By and large, professional educators have been critical of the work accomplished by the military and industry and have failed to recognize the contributions of each. However, those persons in the fields of instructional technology and media have been less concerned with the feeling that the military and industry are competing with professional education, less critical of their efforts, and more inclined to work with all groups--military, industry, and professional education.

Schools and Colleges. Programs in audiovisual instruction and schools of library science are changing their curricula to include concepts of instructional technology and media. Departments of audiovisual instruction are now called departments of instructional or educational technology, educational media, educational communications, instructional systems, or combinations of these terms. For example, the school of library and information science at Syracuse University

²⁴Donald T. Tosti and John R. Ball, A Behavioral Approach to Instructional Design and Media Selection. Albuquerque: Westinghouse Learning Corporation, 1969.

is now called the School of Information Studies, and the school library program at Alabama A and M is in the School of Library Media.

Schools and colleges have also created divisions of instructional development engaging in research and development of educational programs (e.g., Portland Community College, Florida State University, Syracuse University). These divisions plan courses of instruction with faculty, design the materials and management systems, frequently supervise some or all of the instruction, and make cost-benefit analyses of educational programs.

Professional Organizations. The most influential national organization promoting the systematic application of instructional technology and media is the Association for Educational Communications and Technology (AECT), formerly the Department of Audio-Visual Instruction (DAVI) of the National Education Association (NEA). Through journals, pamphlets, and books, AECT and its Division of Instructional Development have been actively promoting instructional technology and media. In 1962, a DAVI task force wrote:

A new kind of professional will be required to provide leadership in design, implementation, and evaluation of programs in education which make the fullest use of new media. The functions performed by this leader and the resources he brings will be among the essential determinants of success or failure in tomorrow's schools.²⁵

Another association actively promoting instructional technology is the American Association of School Librarians (AASL), a division of the American Library Association (ALA). AECT and AASL have collaborated in publishing the 1975 guidelines entitled Media Programs:

²⁵Barry Morris, ed., "The Functions of Media in the Public Schools," Audiovisual Instruction, 8 (January, 1963), 11.

District and School. The 1975 standards promote the wide application of instructional technology and media and describe the steps of the process:

- Generating goals from educational purposes
- Translating goals into objectives suitable for analysis
- Analyzing objectives
- Identifying constraints (physical, financial, time, legal, and policy factors)
- Generating alternatives
- Conducting trade-off studies and selecting among alternatives
- Developing prototypes
- Conducting developmental testing programs
- Administering field tests
- Installing instructional systems
- Designing monitoring systems²⁶

In addition, following the paradigm presented earlier, Media Programs: District and School places the learner in the center of the educational program and stresses the interaction of learners with ideas, processes, self, others, realia, media, and environments.²⁷ It is also significant that Media Programs: District and School and Guidelines for Two-Year College Learning Resources Programs (ALA-AECT, 1972) place all materials of instruction including the library under a single unified program and include the management of instructional development as part of the media program (learning resources program). Both documents recommend that the directors of such programs be members of the general governing councils of their institutions.

The singleness of purpose of these organizations has provided the impetus for mergers of state-level professional organizations. The most common merger is between the state school library association

²⁶AASL and AECT, Media Programs: District and School. Chicago: American Library Association, 1975, 112-113.

²⁷William E. Hug, "A Rationale for the Preparation of Media Specialists." First draft. New York: Teachers College, September, 1975, 1.

and the state media association. In at least one state, Florida, there has been a three way merger including the state educational TV association.

AECT and AASL have also had a considerable impact on standards for certification of basic education professionals as well as upon those working directly in instructional technology and media. Since the introduction of the role of the media specialist, state departments of education have been changing titles such as school librarian and audiovisual specialist to media specialist, library media specialist or similar, broader, titles. Similarly, state divisions of audiovisual instruction, educational communications, program development, school libraries and the like have been combining and coordinating these divisions in an effort to better articulate the activities of each. Positions such as state consultant of instructional technology and media, director of state media programs, and coordinator of educational communications and learning resources are emerging.

History

The development of languages and symbols testifies to the fact that from the very beginning humans and their technologies have been partners. People have progressed because they have been able to build upon what others have done. Cultures have been able to extend their capabilities through the invention and utilization of tools and techniques. Although it is debatable whether or not some prehistoric person intelligently chose the first tool or simply stumbled on the implement by accident, there is little doubt about modern culture's careful and deliberate search for technological devices. As people attempt to understand and control themselves and their environments, they gradually move from an era utilizing trial and error as a method for

technological inventing to an era emphasizing technique in order to create devices to further augment a human's basic capabilities.²⁸

In a sense, the success or failure of any teacher throughout history is related to the type of technology he or she employs. All great teachers have had "the patience and persistence that are necessary to build a structure of methods and programs to carry... idea into practice."²⁹ The ancient Greeks used manuscript rolls and wax tablets³⁰ and Greek Sophists employed "analytic approaches to instruction through rhetoric, dialectic, grammar, and techne (technology)."³¹

The invention of moveable type (circa 1500), the development of textbook technology, and the establishment of libraries as well as the methods and materials used by historical figures such as Socrates, Plato, Abelard, Comenius, and Pestalozzi have contributed to the technology of instruction. The same is true for the Lancastrian System, the Montessori schools, the Winnetka Plan, and Summerhill.

With the exception of present day Montessori schools and Summerhill, none of these people or systems had access to some 300,000 commercially available materials plus the thousands of additional

²⁸William E. Hug, Instructional Design and the Media Program. Chicago: American Library Association, 1975, 47.

²⁹Edgar Dale, "Historical Setting of Programed Instruction," Programed Instruction. 66th Yearbook of the National Society for the Study of Education, Part II. Chicago: University of Chicago Press, 1967, 28-54.

³⁰Luella Cole, A History of Education. New York: Holt, Rinehart and Winston, 1950, 61-62.

³¹Phil C. Lange, "History and Principles of Instructional Media, Educational Communications and Technology." New York: Teachers College, 10 mimeographed pages, 1.

materials modern educational programs produce locally.³² Nor did these historical figures or programs need to cope with the millions of volumes maintained by libraries, modern information retrieval systems, information networks, microfiche, microfilm, video disks, computer systems, and the fact that information is doubling every eight years. Nor did they consider the impact of television on their cultures.

Children view more than 8,000 hours of television during their preschool years, thereby entering school with a technological sophistication that often exceeds the school's capacity to respond. Mass media keep learners instantly informed and often frustrated by articulating problems which seem strangely isolated from school programs. In addition, mass media make the problems of the world community evident to the young. These young people must reconcile the myopic behavior of the culture with the needs of people everywhere if they are to free themselves to engage in more abstract learning activities.³³

World War II is generally recognized as the beginning of the fields of instructional technology and media as they are currently conceived.

Three distinct but overlapping emphases were discernible during this period [World War II to 1969]. (a) First, there was the traditional emphasis upon materials and equipment as *aids for teaching or tools for teachers*. (b) Then, partly in response to propaganda studies, mass communication and out-of-school applications, and research with educational media, there was a more fundamental focus upon *communication and learning as a process*. (c) More recently, support has developed for a more comprehensive emphasis that includes a whole *systematic or technological organization for the support of instruction*, wherein the expected outcomes from learning are interrelated predictably to learning activities,

³²Donald P. Ely, "The Emerging Role of Technology in Education: The Materials of Instruction." A paper presented to the School of Education at Utah State University, Logan, Utah, summer, 1975, 1.

³³William E. Hug, Instructional Design and the Media Program. Chicago: American Library Association, 1975, 11.

and the system provides for monitoring, feedback, and readjustment so as to maintain a qualitative level of performance. Actually, this technological or systems emphasis assumes the interdependence of accountable sub-systems, such as administrative and curricular organizations, habits and cultural rewards, learning resources, financial support, performance schedules and behavioral consequences, and the instructional system itself; its strategy calls for initial study of the network of consequences among these systems as prelude to making decisions about instructional media and the behaviors to be elicited.³⁴

As such, the fields of instructional technology and media are emerging as truly interdisciplinary efforts in need of the highest level of collaboration. Denying that the fields exist or claiming that they are really part of other sectors of the education professions seems to beg the question.

Roles

The fields of instructional technology and media are partially a result of the shift away from the separate audiovisual, library, communication, and curriculum movements toward a systems approach to the organization and management of instruction. The field is also developing from work being performed in industry, the military, and from professionals in such areas as psychology, sociology, and philosophy.

In 1970, an attempt was made to describe the fields of instructional technology and media by creating a matrix placing the functions performed

³⁴Phil C. Lange, "History and Principles of Instructional Media, Educational Communications and Technology." New York: Teachers College, 10 mimeographed pages, 1.

by professionals on one side of the matrix and responsibility groupings on the other. The resulting grid organized some 150 tasks.³⁵ One year later a comprehensive study of functions performed by instructional technologists and media professionals was published by NEA. This report clustered the work being performed in the field into three categories of work: (1) media management, (2) media product development, and (3) instructional program development.³⁶ These categories were directly related to the professional roles of personnel in the field and also the titles these professionals held.

In 1974, the Task Force on Accreditation and Certification of AECT prepared profiles for each of the three clusters. This tabulation provides references to statements of specific competencies and a distribution of competencies among nine areas for each of the three categories identified by Jobs in Instructional Media Study (see FIGURE 1).

During this same period the School Library Manpower Project (SLMP) of the American Association of School Librarians, ALA, was conducting a series of studies and experiments. This project began by identifying exemplary media programs in schools by making a comprehensive study of the roles professionals play in these settings.³⁷

³⁵Dale G. Hansen, ed. Media Guidelines: Development and Validation of Criteria for Evaluating Media Training. Washington, DC: Bureau of Research, U.S. Office of Education, 1970.

³⁶Anna L. Wyer, et al., Jobs in Instructional Media Study. Washington, DC: Division of Educational Technology, National Education Association, 1971.

³⁷Robert W. Case and Arna Mary Lowery, eds., Behavioral Requirements Analysis Checklist. Chicago: American Library Association, 1971.

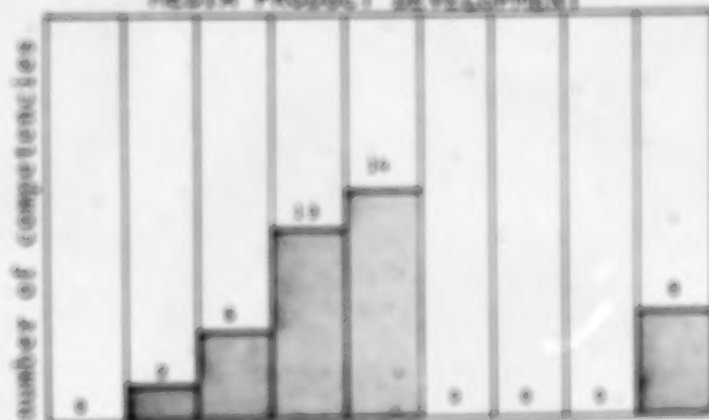
- 1 Organization Management
- 2 Personnel Management
- 3 Research and Theory
- 4 Design
- 5 Production
- 6 Evaluation and Selection
- 7 Support and Supply
- 8 Utilization
- 9 Utilization/Dissemination



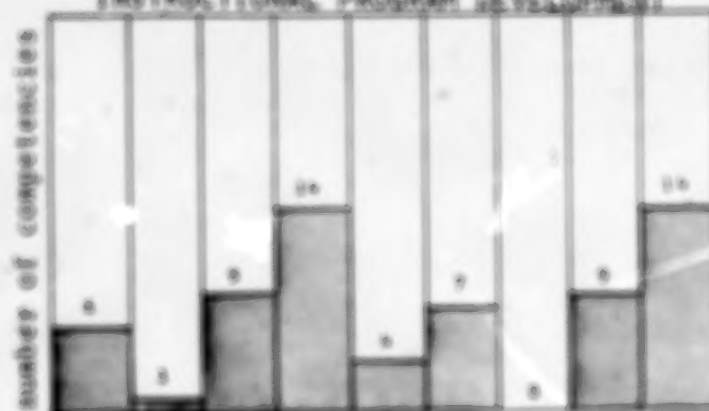
MEDIA MANAGEMENT



MEDIA PRODUCT DEVELOPMENT



INSTRUCTIONAL PROGRAM DEVELOPMENT



NOTE: Adapted from William C. Priggs, "Accreditation and Certification: A frame of Reference," *Audiovisual Instruction* 9 (November, 1974), pp. 17-18. Lists of competencies are stated in this same issue, pp. 29-69.

FIGURE 1

THREE COMPETENCY AREAS OF INSTRUCTIONAL TECHNOLOGY AND MEDIA

persons, its institutional setting, and its role in the development of the nation. The program is designed to provide a comprehensive and integrated approach to the development of the nation, and to provide a framework for the development of the nation.

Operational Role. The program is designed to provide a comprehensive and integrated approach to the development of the nation, and to provide a framework for the development of the nation. The program is designed to provide a comprehensive and integrated approach to the development of the nation, and to provide a framework for the development of the nation.

Operational Role. The program is designed to provide a comprehensive and integrated approach to the development of the nation, and to provide a framework for the development of the nation. The program is designed to provide a comprehensive and integrated approach to the development of the nation, and to provide a framework for the development of the nation.

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1.1.1.4. The role of the program in the development of the nation is described in the following sections. The role of the program in the development of the nation is described in the following sections.

Research in Instructional Technology and Media

Although motion pictures and radio were early areas for research, investigations quickly moved to include all kinds of delivery systems and encoding forms--environments, realia, still and moving images, symbols, and language. Media are now viewed as responsive systems capable of two-way communication and are an integral part of the process of creating an instructional program. The responding dimensions (e.g., covert, affective, overt--vocal, motor) and the management and distribution of media are also areas of research in instructional technology and media.

Today, the most glaring needs are to develop a technology to estimate the informational needs of various publics and to develop a research base that supports the kind of sensitivity Comenius, Pestalozzi, Mark Hopkins, Elias Perry, and Montessori had for learners by reconceptualizing the educational process. Assessing the informational needs (knowledge) of various publics concerned with education means changing the way professional knowledge is accessed, used, generated, and evaluated by both researchers and practitioners. As implied earlier in the discussion of philosophies, both the literary (theoretical-deductive) and the scientific (empirical-inductive) ways of knowing can contribute to this endeavor and can reconcile differences as each matures. Toward this end, research in instructional technology and media must operate from an interdisciplinary base and become free from the politics that have traditionally encouraged the establishment and protection of territories and groups rather than collaboration.

Research in Media and Communication.⁴⁵ Experimental studies investigating the usefulness of films began in 1918⁴⁶ and continues today. Notable among these were the Johns Hopkins University Studies,⁴⁷ experiments at the University of Chicago,⁴⁸ work sponsored by Eastman Kodak Company,⁴⁹ the Yale University Studies,⁵⁰ findings of the Harvard Film Foundation,⁵¹ the research of W. W. Charters at the Ohio State University,⁵² and the investigations of the Motion Picture Project of the American Council on Education.⁵³ These studies generally established the credibility of films as a medium for instruction and established them as a unique source of information and knowledge. The theories,

⁴⁵This discussion brings out some of the more important studies discussed in part two of Paul Ssettler's A History of Instructional Technology. New York: McGraw-Hill, 1968.

⁴⁶David R. Sumatine, "A Comparative Study of Visual Instruction in the High School," School and Society, 8 (February, 1918), 235-238.

⁴⁷K. S. Lashley and J. B. Watson, A Psychological Study of Motion Pictures in Relation to Venereal Disease Campaigns. Washington, DC: U.S. Interdepartmental Social Hygiene Board, 1922, 3.

⁴⁸Frank N. Freeman, Visual Education. Chicago: The University of Chicago Press, 1924, 79.

⁴⁹Ben D. Wood and Frank N. Freeman, Motion Pictures in the Classroom. Boston: Houghton Mifflin Company, 1929, 223. Ben D. Wood was director of the Bureau of Collegiate Educational Research, Columbia University.

⁵⁰D. C. Knowlton and J. W. Tilton, Motion Pictures in History Teaching. New Haven, CT: Yale University Press, 1929, 90.

⁵¹P. J. Eulon, The Sound Motion Picture in Science Teaching. Cambridge, MA: Harvard University Press, 1933.

⁵²W. W. Charters, Motion Pictures and Youth. New York: Macmillan, 1935, vi.

⁵³Perhaps the most significant project during the 1930s investigating motion pictures. This project set the pattern for instructional programs of both the U.S. Office of Education and the Armed Forces during World War II.

insights, and procedures used by this early group of researchers clearly set the stage for investigations of the U.S. Office of Education and the Armed Forces during World War II.

In radio research, the Ohio State University began studying the social and psychological effects upon school age students⁵⁴ and also made the first attempt to describe and catalogue radio programs for use in schools.⁵⁵ During this same period, the University of Wisconsin and Princeton University began studying more specific effects, strengths, and limitations of radio as a medium of instruction and communication. The type of findings reported by Lazarsfeld were typical of the film and radio research of this period.

1. For listeners to the serious type of program, content of the program is more important than dramatic effects or personalities of the speakers.
2. People not likely to read for serious content are usually unlikely to listen for serious content.
3. Low-income families who read little are inclined to listen to the radio extensively and to seek the escape that comes with the non-serious content.
4. Higher-income families who have a wide variety of interests and available entertainment find most radio programs, which are commonly written for the listener with average ability and tastes, to be rather boring.⁵⁶

Research in all media became increasingly sophisticated and comprehensive during World War II (e.g., Hovland, Lumsdaine, Sheffield⁵⁷).

⁵⁴Norman Woelfel and I. Keith Tyler, Radio and the School. Tarrytown-on-Hudson, NY: World Book, 1945, iii.

⁵⁵J. Robert Miles, Recordings for School Use: A Catalog of Appraisals. Tarrytown-on-Hudson, NJ: World Book, 1942.

⁵⁶Paul F. Lazarsfeld, Radio and the Printed Page. New York: Duell, Sloan and Pearce, 1940, vii.

⁵⁷Carl I. Hovland, A. A. Lumsdaine, and Fred D. Sheffield, Experiments on Mass Communications. Princeton, NJ: Princeton University Press, 1949, 3.

It was during this period that the value of audio and visual aids as recognized tools of instruction was established. From this period began the wide invention and testing of all kinds and combinations of print, still and moving images, audio, tactile, and combinations of man-machine systems. It is also during these early forties that communication theory, models, and research had their beginnings.⁵⁸

Studies continued to stress the value of film but in a more and more specific and analytical sense. Old findings were confirmed (e.g., Nebraska Film Project reaffirmed that films provided information not available from other sources⁵⁹) and new research began to use controlled experiments to study effects of color, animation, background music, and the like (e.g., Yale studies⁶⁰).

After 1950, the kind and type of research developed to investigate motion pictures and radio were applied to television. Techniques included psychological-experimental approaches, propaganda and persuasion analysis, surveys, and small group analysis.

During the mid-fifties, Pennsylvania State University began the first in a long series of no-significant-difference experiments that plagued research in instructional technology and media for years to come.⁶¹ However, the key to unlocking the mystery of the no-significant-difference syndrome was being discovered during this time as Washington

⁵⁸Claude Shannon and Warren Weaver, The Mathematical Theory of Communication. Urbana, IL: University of Illinois Press, 1949.

⁵⁹Wesley C. Meierhenry, Enriching the Curriculum through Motion Pictures. Lincoln, NE: University of Nebraska Press, 1952, 28.

⁶⁰Mark A. May, Planning Films for Schools: The Final Report of the Commission on Motion Pictures. Washington, DC: American Council on Education, 1949.

⁶¹L. Siegel and L. C. Siegel, "The Instructional Gestalt: A Conceptual Framework and Design for Educational Research," AV Communication Review, 12:1 (Spring, 1964), 16-45.

County, Maryland, found that difference related to the way television was introduced into the process of the total instructional system.⁶²

Research in Instructional Technology, Systems, and Programmed Instruction. The concept of cybernetics introduced by Wiener⁶³ has many implications for education as a process of interaction, of actions and reactions, and of the role of information in all systems. The process orientation of communication theory (e.g., Berlo⁶⁴) and the fusing of the literary and scientific by Bertalanffy,⁶⁵ Cassirer,⁶⁶ and Churchman⁶⁷ have contributed to the persuasiveness of the process approach which is the heart of instructional technology. Equally important is the experimental work of early research in programmed instruction--Pressey,⁶⁸ Rushton,⁶⁹ Klaus and Lumsdaine.⁷⁰ From the

⁶²Washington County Board of Education, Washington County Closed-Circuit Television Report. Hagerstown, MD: Washington County Board of Education, 1963, 47-53.

⁶³Norbert Wiener, Cybernetics. New York: John Wiley and Sons, 1948.

⁶⁴David K. Berlo, The Process of Communication. New York: Holt, Rinehart and Winston, 1960.

⁶⁵Ludwig von Bertalanffy, General Systems Theory. New York: George Braziller, 1968.

⁶⁶Ernest Cassirer, The Philosophy of Symbolic Forms. New Haven, CT: Yale University Press, 1953.

⁶⁷C. West Churchman, The Design of Inquiring Systems: Basic Concepts of Systems and Organization. New York: Basic Books, 1971.

⁶⁸S. L. Pressey, "Development and Appraisal of Devices Providing Immediate Automatic Scoring of Objective Tests and Concomitant Self-Instruction," Journal of Psychology, 29 (1950), 417-447.

⁶⁹E. W. Rushton, Programmed Learning: The Roanoke Experiment. Chicago: Encyclopedia Britannica, 1965.

⁷⁰David J. Klaus and A. A. Lumsdaine, An Experimental Field Test of the Value of Self-Tutoring Materials in High School Physics. Pittsburgh: American Institute for Research, 1960.

very beginning programmed instruction became interested in the process of instruction, including the influences of cueing, pacing, reinforcement, sequencing, management, and readiness on the teaching-learning process. The proliferation of studies since 1960 in programmed instruction are too numerous to mention here; however, their impact may be seen in the move from the concept of programmed instruction to programming which is closely associated with modern concepts of instructional technology and its total systems approach. These studies have deep implications for the way all media are constructed as well as for the roles teachers and media play in the total process. It should also be noted that the programmed instruction movement brought the work of experimental psychology to bear on the creation of instructional materials in a practical and researchable way.

The establishment of Regional Educational Research and Development Centers by the U.S. Office of Education in the sixties offered direct support to the instructional technology movement, including the developing sub-specialty of instructional development. Both the Southwest and Northwest Regional Laboratories have produced widely used books and materials. Although not all of the centers proved as successful as these two, the Educational Research and Development Centers put into practice the concept of interdisciplinary work in instructional technology as they included behavioral scientists, subject-matter specialists, instructional technologists, media specialists, teachers, and administrators. The idea of a research and development center has been adapted by both schools and universities and is a good example of a contemporary application of instructional technology. In this regard, Robert Diamond comments on his work at Syracuse University:

Perhaps the two most significant things about the Center are in name--the phrase "instructional development" . . . and the fact that its 10-person professional staff has the high level leadership of an assistant vice-chancellor who reports directly to the same academic vice-chancellor as the University's deans.

. . .

The Center's projects are large in scope, ranging from the redesign of entire courses like Introduction to Religion, Freshman English Composition, Psychology, Communications and Society, or a 2-year Calculus sequence, to the curriculum of an entire program such as Music Education or the first year in the School of Architecture.⁷¹

Another such center in New York State comments: "Our job is simply to provide any professor on this campus with the widest range of options for strengthening and enlivening his teaching."⁷²

It is in this real world where instructional technology and media are making their greatest contribution and where the work that needs to be done becomes increasingly evident. It is also in the real world where systems make sense, where

- everything is connected to everything else
- everything is going somewhere
- nature knows best
- there is no such thing as a free lunch.⁷³

⁷¹Ronald Gross, "Instructional Unit Offers Ideas not Hardware to Spur Change," Planning for Higher Education, 4:3; 3/5 (June, 1975), 1.

⁷²Ronald Gross, "Media Options for Improving Instruction," Planning for Higher Education, 4:3; 4/5 (June, 1975), 1.

⁷³Barry Commoner, The Closing Circle. New York: Knopf, 1971, 32-46.

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